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ABSTRACT

To assess the relationship between advertising and consumer promotion and to determine the optimal short-term advertising spending level for a product, a research project was undertaken by a major food manufacturer. One thousand homes subscribing to a dual-system cable television service received either no advertising exposure to the product or heavy exposure for 26 four-week periods. Sales volume was used as the dependent variable and the following as independent variables: daytime and nighttime advertising spending levels of the product, consumer promotion level of the product, interaction of these two variables, second order terms of daytime and nighttime advertising variables, seasonal factor, and panel difference. The findings suggested that nighttime but not daytime advertising tended to complement consumer promotion activities. They also suggested that it was more useful to devise a number of advertising spending plans rather than a single one for the optimal short-time spending level. By identifying the interaction effect of media advertising and consumer promotion, the research project enabled the company to plan spending levels for the greatest return on its advertising investment and helped it to develop guidelines for media advertising scheduling. (FL)

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AN EMPIRICAL APPROACH TO DETERMINING ADVERTISING SPENDING LEVEL

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"How much to spend for advertising?" This question is by no means new. Advertisers and their advertising agencies have been plagued perennially by this question as they have grappled with problems of how to invest advertising dollars for maximum return in product sales or market share. In a typical annual marketing planning meeting, this is probably one of the most important questions for a marketing manager to answer, and probably one of the most nagging issues for an agency account executive to confront. During the past two decades, however, management and research professionals in marketing and advertising have reached a higher level of sophistication in the methods and techniques they use to determine advertising budgets. A number of articles and books including some monumental work -- notably by the Association of National Advertisers -- on the subject have been published (1,2,3,4,5,6).

The primary purpose of this paper is to report a study of the use of a standard empirical method to search for an optimal advertising spending level (in the context of a short-term advertising effect -- one to two years -- rather than a long-term advertising effect). This paper is based on some key findings of a research program, conducted by a major food manufacturer for one of its major product lines. The product is a nationally distributed commodity-type product with a mature product life cycle. The product has a leading market share position in a declining market for the product category, competing against several

major premium and price brands. The product has a history of moderate advertising support and heavy consumer promotion support. The media advertising (largely television) and consumer promotion have been programmed into a marketing plan executed according to the seasonal pattern of the product sales.

In an annual marketing strategy meeting, a question of advertising spending level was raised: "Should we increase or decrease our advertising dollars from the current level? If so, how much? And how to do it?" The marketing judgment at the time was that a substantial short-term cut in media spending could be made with minimum impact on market share. Management, however, was not certain of the size of such a reduction. In addition, they were concerned with the possible effects of advertising reduction on consumer promotion, for they suspected some interaction effects working between media advertising and consumer promotion.

RESEARCH DESIGN

The marketing questions above were scrutinized and translated into the following research objectives:

a. To assess the relationship between advertising and consumer promotion;

b. To determine the optimal (short-term) advertising spending level for the product.

After careful examination of various research methods for their feasibilities and applicabilities, a field experiment method utilizing a dual-system CATV service was selected for the research project. The principle underlying this field-experiment approach to measuring

response to television advertising corresponds to the split-run approach to measuring response to print advertising. CATV subscribing homes in a test city are wired to either Panel A or Panel B of the dual-system. All variables (weather, product distribution, competitive advertising, trade and consumer promotion, price) except those being tested were identical for both panels. The two panels of about 1,000 homes each were matched on demographics, TV viewing habits, and buying habits of the product category. All panel home members were asked to keep a weekly consumer diary of some food, drug, and other purchases, which became the major source of data for the analysis of the sales and market share. In this study, the Panel A home received no advertising exposure to the product (a "zero-weight" level) while the Panel B homes received advertising exposure (a "heavy-up" level) for a total of 26 4-week periods.

DATA TREATMENT AND ANALYSIS

A standard multiple regression analysis was applied to the collected data, using sales volume (4-week purchase volume of the product per reporting panel home) as the dependent variable. The following variables were treated as independent variables:

a. Advertising spending level of the product, in terms of daytime and nighttime. Actual Gross Rating Points (GRPs) per 4-week period were used as input data;

b. Consumer promotion level of the product, expressed as a percentage of volume sold on consumer promotion (deal). Code values from 0 through 4 were used to represent the degrees of the deal levels per 4-week period;

c. Interaction terms between the advertising variables (daytime and nighttime) and the consumer promotion variable;

d. Second order terms of daytime and nighttime advertising variables. The second order terms were introduced to identify possible curvilinear effects of the advertising variables (these were GRP values squared);

e. Seasonal factor, in terms of 13 periods of 4 weeks each. Dummy variable (1 or 0) was used for the 13 periods;

f. Panel difference; Panel A was given 1 and Panel B was given 2 as input values.

Input data were arranged for each 4-week period for both A and B panels; thus a total of 52 observations were obtained for each variable. Therefore, the unit of analysis was the 4-week period.

The results of the regression analysis and related data are displayed in Table 1. As indicated in the table, the regression equation seemed to fit quite well, explaining 85% of the variation of response. Examination of all regression coefficients, both signs and magnitudes, was performed to check their logical implications. With the results of the regression model as given, the next step was to find the range of daytime and nighttime advertising levels necessary for the maximum attainable sales volume. By utilizing the theory of elementary calculus, the marginal purchase equations for daytime and nightime were obtained, and the conditional range of these two advertising variables was calculated.*

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*A detailed description of computational procedures may be obtained by writing to the authors.

Table 1

Key Results of Multiple Regression

	Regression Coefficients	t-Value	Input Means
Dependent Variable			
Sales volume (purchase volume per household per 4-week)	-	-	1.064
Constant	.4748	7.00	-
Independent Variables			
A. Experimental:			
. Daytime (GRPs)*	.8868	3.20	.736
. Nighttime (GRPs)*	-.5044	1.88	.906
. (Daytime GRPs)^2	-.1054	2.70	1.898
. (Nighttime GRPs)^2	.0702	2.04	2.958
. "Deal" of brand	.3220	10.96	2.017
. Daytime x "deal"	-.1838	3.46	1.376
. Nighttime x "deal"	.0796	1.78	1.470
B. External:			
. Panel Differences	-.1368	3.46	1.500
. Seasons**			
Period #1	.0440	.56	.100
Period #2	.2306	2.38	.100
Period #3	.0758	.72	.067
Period #4	.0546	.52	.067
Period #5	.2820	2.12	.067
Period #6	.6588	5.66	.067
Period #7	.1378	1.48	.067
Period #8	.0000	-	.067
Period #9	.3156	2.88	.067
Period #10	.2422	2.48	.067
Period #11	-.0838	.72	.067
Period #12	.1646	2.16	.100

R^2 = .85

**Dummy variable treatment for 13 periods of 4 weeks each.

*Day and nite GRP are in units of 100 GRP's.

Finally, using the marginal purchase equations with cost and profit figures for the product, a number of alternatives for the short-term optimal advertising spending level were determined. To determine the short-term optimal level of daytime and nighttime GRPs, the basic economic principle of marginal cost of GRPs (e.g., one day GRP) equal to its marginal return of TV advertising at each given consumer promotion level was used. For example, for a given consumer promotion level, by using the daytime marginal purchase equation and equating it to the daytime GRP marginal cost, the equation for the daytime GRPs was derived.

FINDINGS AND DISCUSSIONS

Some key findings obtained from the regression model and the subsequent marginal purchase equations analyses may be summarized as follows:

1. The relationship between advertising and consumer promotion for the product was a complex matter: (a) Daytime TV advertising was more effective during the time when the consumer promotion activities were light; (b) Nighttime advertising was more effective during the time when the consumer promotion activities were heavy. In other words, nighttime advertising for the product tended to complement consumer promotion activities, while daytime advertising did not.
2. Determining the optimal advertising spending level for the product was also a complex matter: (a) A ceiling effect was noted for daytime advertising of the product beyond which daytime advertising was not effective. The calculated maximum

daytime advertising was 421 GRPs in a 4-week period for the product; (b) A threshold effect was noted for nighttime advertising below which nighttime advertising was not effective. A total of 189 GRPs was calculated as the minimum nighttime advertising in a 4-week period for the product (when Deal level = 3).

3. It was more practical and useful to come up with a number of alternative advertising spending plans rather than a single advertising spending plan for the short-term optimal spending level. Alternative plans would provide flexibility in media spending (e.g., media time scheduling) while maintaining a certain set of objectives such as product sales or profit.

To illustrate the above findings, two alternative advertising plans for the product are presented. As shown in Table 2, Plan I called for all day time advertising of 1980 GRPs a year in three flights. As indicated, these flights were the time periods when the consumer promotion (deal) levels were relatively low. On the other hand, Plan II called for a mixture of both day and night advertising. This plan used the same number of daytime GRPs for the same flights of the time schedule as that of Plan I, but added 1050 GRPs for nighttime television. The nighttime television allocation was for a flight covering three consecutive 4-week periods in the time periods when the consumer promotion activites were heavy.

Estimates from the cost and profit analysis for the product indicated that either Plan I or Plan II would result in essentially the same product sales volume as the current sales volume, but a higher profit return

Table 2

Two Alternative Plans For Advertising Spending Level

Time Period (4-week per period	Consumer Promotion Level*	Plan I (GRPs)		Plan II (GRPs)	
		Daytime	Nighttime	Daytime	Nighttime
Period #1	1	330	0	330	0
Period #2	1	330	0	330	0
Period #3	3	0	0	0	380
Period #4	3	0	0	0	370
Period #5	3	0	0	0	300
Period #6	1	330	0	330	0
Period #7	1	330	0	330	0
Period #8	2	0	0	0	0
Period #9	2	0	0	0	0
Period #10	1	330	0	330	0
Period #11	1	330	0	330	0
Period #12	2	0	0	0	0
Period #13	2	0	0	0	0
Total GRPs:		1980	0	1980	1050
Estimated Sales Volume (in Million Units)		16.5		19.3	
Estimated Profit (in Million Dollars)		9.2		8.9	

*Coded according to percentage of sales volume (of the product) sold on consumer promotion (deal) for each 4-week period. Ranging from 0 to 4; the higher the number, the higher the promotion activities.

than the current advertising program. Both plans called for a reduction from the current spending level of advertising: Plan I called for a substantial reduction (more than 60%); Plan II called for a considerable reduction (more than 15%). It is also important to note here that Plan I had a slight edge over Plan II on profit margin ($9.2MM vs. $8.9MM), while Plan II had a slight edge over Plan I on sales volume (19.3MM units vs. 12.1MM units).

The findings of the research program -- a field experimental consumer research, coupled with the analyses of the regression model and the marginal purchase equations -- provided the product managment with useful quantitative bases for their understanding and decision-making process regarding advertising spending. The initial marketing judgment as to a reduction in media spending was not only supported, but also was substantiated with documented evidence and new insights by the research program. The product management was now given a number of alternative plans or options to work on. By taking into account key marketing variables such as advertising spending (daytime and nighttime) and consumer promotion for each seasonal time period, they could estimate sales volume and profit levels for the product, or for a set goal of profit or sales volume they could compute a necessary spending level for advertising. The research program was now able to give much flexibility for product management to plan the spending levels for the optimal return of their investment in advertising and to develop guidelines for media scheduling for daytime and nighttime television advertising.

Another significant contribution of the research program to product management was made on the marketing issue of the interaction

effects working between two or more marketing variables. A marketing question such as "Do advertising and consumer promotion interact to produce an effect on sales?" is a standard question of the marketing research professionals (7). For this study, the interaction effects of media advertising with consumer promotion were identified: Nighttime advertising for the product showed a positive interaction effect with the consumer promotion, but daytime advertising had a negative interaction effect with the promotion factor.

In summary, this study demonstrates the efficacy of the empirical approach to answering the question "How much to spend for advertising" for the product, and suggests some applicabilities of the methods and techniques to the solution of similar marketing problems to this case study. It should be noted here once more that this study dealt with a short-term advertising effect rather than a long-term and cumulative effect of advertising which has many other phases of effects on consumers and trades for the brand image formation and change, among others.

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